Appendix I

BUILD YOUR OWN ALTERNATIVE

A: "Build Your Own Alternative"

This appendix is designed to enable people throughout the region to build their own version of the "right" plan for the fish and wildlife mitigation and recovery effort. Subsequently, the different perspectives provided through the alternatives that people develop will help shape the ultimate Policy Direction that the BPA Administrator will select as the preferred alternative direction for BPA's unified planning approach. Recognizing that policies underpin the region's fish and wildlife mitigation and recovery choices, BPA has chosen to focus this EIS on a range of distinctly different, but reasonably foreseeable, policy directions (Chapter 3). One or more of these directions through mixing and matching will likely serve as the combination that will ultimately guide BPA's fish and wildlife program implementation and expenditures. To help in the development and understanding of building your own alternative, BPA has used the two major processes being followed under ESA, the NMFS 2000 Biological Opinion and USFWS 2000 Biological Opinion (BiOps), to illustrate how it is done from the information and data in this EIS (Section C below).

As you begin this procedure keep in mind the need to stay focused on the overall objective you are trying to accomplish with your proposal. It is easy to get mired down in details and exceptions to the rule. Since the science for fish and wildlife recovery is uncertain and still developing, much of the difficulty you will experience will be with conflicting social mandates, laws, and personal values (Chapter 2). This conflict and need for making trade-offs is the greatest challenge in making public policy. Remember, trying to accommodate too many values will likely lead to an outcome indicative of none.

There are three basic steps to building your on alternative:

Step one: assess the status of the current fish and wildlife mitigation and recovery effort. Review Section 2.4 in Chapter 2 to gain an understanding of the existing environmental conditions in the region where the fish and wildlife mitigation and recovery effort is underway.

Step two: determine the actions that will best define the proposal for your fish and wildlife mitigation and recovery effort. Review the tables of Sample Implementation Actions in Chapter 3, Section 3A. These tables will first give information about the current state of the mitigation and recovery effort (Status Quo) and then offer numerous examples of the types of actions that have been proposed throughout the region by individuals, interest groups, tribes, states, and federal agencies. The sample actions are sorted by Key Issue areas (Chapter 3, Section 3.1.2) and grouped into one of the five Policy Directions examined in this EIS (Chapter 3, Section 3.2). From these actions, select the ones that best represent your proposal for each of the Key Issue areas. Table A below is provided to help you track your choices of actions and get a visual

representation of your proposal. Section B shows several examples of these illustrations filled out for other proposals throughout the region (Tables B-K).

Step three: determine the environmental consequences of your proposal. Review Chapter 5, section 5.2, to get a general understanding of how and where fish, wildlife, and human effects occur with respect to any plan for fish and wildlife mitigation and recovery. Keep in mind that Section 5.2 is set up to provide checks and balances of the impact areas. The land, water, and fish/wildlife sections are presented from the fish and wildlife perspective because they are the main areas associated with their habitats and daily activities. The air, social, and economic sections are presented from the human perspective because these are the main areas of immediate concern to the daily lives of humans. Obviously, some of these categories effect both fish and wildlife and humans. The grouping was not meant to be exclusive, rather the objective was to ensure an understanding of how the activities and actions taken to help fish/wildlife or humans may impact the other.

Next, review Section 5.3 for an explanation of how the effects from the different sets of sample actions for each Policy Direction change in relationship to the Status Quo. An illustration based on the explanation is given for each environmental consequence. These illustrations are given to offer a visual cue of whether a set of actions is moving the effects in a more positive or negative direction as compared to Status Quo. Using these explanations and illustrations consider where your proposal lies in relationship to the different Policy Directions. Match the effects with your selected set of actions. Realizing that you probably mixed portions of some of the Policy Directions with one another, you will need to do the same with the environmental consequences areas in order to reflect your mix and match approach.

If you want to delve a little deeper into the effects assessment, Table L below is provided to help you understand where the Key Issue area actions and the environmental consequences intersect. From this intersection, you may develop your explanation of the changes from Status Quo to your proposal.

Several cautions are in order for anyone wishing to "mix and match."

- *Compatibility.* Not all combinations of actions are possible; some actions are mutually exclusive.
- *Consistency*. Choosing actions from several different Policy Direction implementation actions may result in a plan that is truly indicative of none.
- *Effectiveness*. A "scattershot" technique that tries to reach too many goals with too little money for each will likely dilute the desired effect.
- *Clarity and Coordination*. The more that different "pieces" of different Directions are mixed, the more likely that confusion might result in interpreting who does what and how.
- *Cause-and-Effect*. If you change or substitute an action, remember that you are also substituting the effects (natural resource and/or socioeconomic) of that action.

Table A: Visual Aid for New Proposal Alternative

Key Regional Issues	Proposal #1 BPA Alt. Policy Dir.[1] NF	WS	SU	SS	CF	Proposal #2 BPA Alt. Policy Dir.[1] NF	WS	SU	SS	CF
1 Habitat										
1-1Anadromous Fish										
1-2 Resident Fish										
1-3 Introduced Species										
1-4 Wildlife										
1-5 Pred. Anad. Fish										
1-6 Watersheds										
1-7 Tributaries										
1-8 Mainstem Col.										
1-9 Reservoirs										
1-10 Estuaries										
1-11 Water Quality										
2 Harvest										
2-1 Anadromous Fish										
2-2 Resident Fish										
2-3 Wildlife										
3 Hatcheries										
3-1 Anadromous Fish										
3-2 Resident Fish										
4 Hydro										
4-1 Dam Mod. & Facil.										
4-2 Hydro Operations										
4-3 Spill										
4-4 Flow										
4-5 Reservoir Levels										
4-6 Water Quality										
4-7 Juv. Fish Trans.										
4-8 Adult Fish Pass.										
4-9 Flood Control										
5 Power										
5-1 Existing Gen.										
5-2 New Energy Res.										
5-3 Trans. Reliability										
6 Industry										
6-1 Industrial Dev.										
6-2 Alum. and Chem.										
6-3 Mining										
6-4 Pulp and Paper										
7 Transportation										
7-1 Navigation										
7-2 Trucking & RR										
8 Agriculture										
8-1 Irrigation										
8-2 Pest./Ag. Practices										
8-3 Grazing										
8-4 Forestry										
9 Commercial Fishing										
10 Resid./Comm. Dev.										
11 Recreation										
12 Tribes										
12-1 Tribal Harvest										
12-2 Trad, Hlth, Spirit										

[2] BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

B: Illustrations of Proposals

Table B: Visual Representation of Status Quo

Status Quo

Key Regional Issues	BPA Alt. Policy Dir. NF	WS	SU	SS	CF
1 Habitat					
1-1Anadromous Fish			■		
1-2 Resident Fish			■		
1-3 Introduced Species		■			
1-4 Wildlife			■		
1-5 Pred. Anad. Fish			■		
1-6 Watersheds	■				
1-7 Tributaries			■		
1-8 Mainstem Col.				■	
1-9 Reservoirs		■			
1-10 Estuaries				■	
1-11 Water Quality		■			
2 Harvest					
2-1 Anadromous Fish				■	
2-2 Resident Fish			■		
2-3 Wildlife			■		
3 Hatcheries					
3-1 Anadromous Fish				■	
3-2 Resident Fish			■		
4 Hydro					
4-1 Dam Mod. & Facil.				■	
4-2 Hydro Operations			■		
4-3 Spill			■		
4-4 Flow			■		
4-5 Reservoir Levels				■	
4-6 Water Quality			■		
4-7 Juv. Fish Trans.			■		
4-8 Adult Fish Pass.				■	
4-9 Flood Control					■
5 Power					
5-1 Existing Gen.			■		
5-2 New Energy Res.				■	
5-3 Trans. Reliability			■		
6 Industry					
6-1 Industrial Dev.				■	
6-2 Alum. And Chem.				■	
6-3 Mining				■	
6-4 Pulp and Paper				■	
7 Transportation					
7-1 Navigation			■		
7-2 Trucking & Rail.			■		
8 Agriculture					
8-1 Irrigation			■		
8-2 Pest./Ag. Practices			■		
8-3 Grazing			■		
8-4 Forestry			■		
9 Commercial					
			■		
10 Resid./Comm.					
			■		
11 Recreation					
			■		
12 Tribes					
12-1 Tribal Harvest				■	
12-2 Trad, Hlth, Spirit			■		

[3] BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

Table C: Visual Crosswalk Between Chapter 3 Tables & Proposed Alternative Policy Directions

Key Regional Issues	Multi-Species Framework Alt. 1					Multi-Species Framework Alt. 2					Multi-Species Framework Alt. 3					Multi-Species Framework Alt. 4					Multi-Species Framework Alt. 5				
	BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]				
	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF
1 Habitat																									
1-1Anadromous Fish	■																	■				■			
1-2 Resident Fish	■						■					■						■						■	
1-3 Introduced Species		■					■					■									■				
1-4 Wildlife		■																				■			
1-5 Pred. Anad. Fish		■					■					■									■				
1-6 Watersheds														■						■					■
1-7 Tributaries		■				■					■									■					■
1-8 Mainstem Col.	■						■					■										■			
1-9 Reservoirs																									
1-10 Estuaries							■					■										■			
1-11 Water Quality		■					■					■					■								
2 Harvest																									
2-1 Anadromous Fish		■					■					■					■						■		
2-2 Resident Fish																		■					■		
2-3 Wildlife																									
3 Hatcheries																									
3-1 Anadromous Fish		■						■				■					■						■		
3-2 Resident Fish	■							■				■						■					■		
4 Hydro																									
4-1 Dam Mod. & Facil		■					■					■					■					■			
4-2 Hydro Operations		■					■					■													
4-3 Spill			■																						
4-4 Flow		■						■									■					■			
4-5 Reservoir Levels		■					■					■					■								
4-6 Water Quality							■					■													
4-7 Juv. Fish Trans.						■					■											■			
4-8 Adult Fish Pass.		■					■					■													
4-9 Flood Control						■					■														
5 Power																									
5-1 Existing Gen.		■					■					■													
5-2 New Energy Res.																									
5-3 Trans. Reliability																									
6 Industry																									
6-1 Industrial Dev.																									
6-2 Alum. and Chem.																									
6-3 Mining																									
6-4 Pulp and Paper																									
7 Transportation																									
7-1 Navigation																									
7-2 Trucking & RR																									
8 Agriculture																									
8-1 Irrigation			■					■			■														
8-2 Pest./Ag. Practices		■					■					■													
8-3 Grazing		■					■					■													
8-4 Forestry							■					■													
9 Commercial Fishing																									
			■					■					■				■									
10 Resid./Comm. Dev.																									
11 Recreation																									
			■					■					■													
12 Tribes																									
12-1 Tribal Harvest		■					■					■				■									
12-2 Trad, Hlth, Spirit																									

[2] BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus .

Table D: Visual Crosswalk Between Chapter 3 Tables & Proposed Alternative Policy Directions

Key Regional Issues	Multi-Species Framework Alt. 6 — BPA Alt. Policy Dir.[1]					Multi-Species Framework Alt. 7 — BPA Alt. Policy Dir.[1]					Human Effects Analysis Appendix D — BPA Alt. Policy Dir.[1]					NPPC Draft 2000 Fish & Wildlife Prog — BPA Alt. Policy Dir.[1]				
	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF
1 Habitat																				
1-1Anadromous Fish			■							■									■	
1-2 Resident Fish			■							■										
1-3 Introduced Species										■										
1-4 Wildlife			■							■								■		
1-5 Pred. Anad. Fish										■						■				
1-6 Watersheds										■								■		
1-7 Tributaries		■																■		■
1-8 Mainstem Col.																				
1-9 Reservoirs																				
1-10 Estuaries																				
1-11 Water Quality																				
2 Harvest																				
2-1 Anadromous Fish			■							■								■		
2-2 Resident Fish										■								■		
2-3 Wildlife																				
3 Hatcheries																				
3-1 Anadromous Fish					■					■								■		
3-2 Resident Fish								■										■		
4 Hydro																				
4-1 Dam Mod. & Facil										■										
4-2 Hydro Operations										■										
4-3 Spill																				
4-4 Flow					■					■								■		
4-5 Reservoir Levels																				
4-6 Water Quality																				
4-7 Juv. Fish Trans.					■					■										
4-8 Adult Fish Pass.										■										
4-9 Flood Control										■										
5 Power																				
5-1 Existing Gen.										■										
5-2 New Energy Res.																				
5-3 Trans. Reliability																				
6 Industry																				
6-1 Industrial Dev.												■								
6-2 Alum. and Chem.																				
6-3 Mining												■								
6-4 Pulp and Paper																				
7 Transportation																				
7-1 Navigation										■		■								
7-2 Trucking & RR																				
8 Agriculture																				
8-1 Irrigation												■								
8-2 Pest./Ag. Practices												■								
8-3 Grazing												■								
8-4 Forestry										■		■								
9 Commercial Fishing																				
							■					■						■		
10 Resid./Comm. Dev.																				
												■								
11 Recreation																				
										■		■								
12 Tribes																				
12-1 Tribal Harvest										■										
12-2 Trad, Hlth, Spirit																				

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Table E: Visual Crosswalk Between Chapter 3 Tables & Proposed Alternative Policy Directions

Key Regional Issues	Spirit of the Salmon					Tribal Vision					Governors' Recommendations					Lower Col. River Estuary Program				
	BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]				
	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF
1 Habitat																				
1-1Anadromous Fish		■						■					■							
1-2 Resident Fish																				
1-3 Introduced Species																		■		
1-4 Wildlife								■												
1-5 Pred. Anad. Fish													■							
1-6 Watersheds			■									■				■				
1-7 Tributaries			■								■									
1-8 Mainstem Col.	■		■					■			■						■			
1-9 Reservoirs								■												
1-10 Estuaries		■						■							■		■			
1-11 Water Quality			■					■							■		■			
2 Harvest																				
2-1 Anadromous Fish			■			■									■					
2-2 Resident Fish															■					
2-3 Wildlife								■												
3 Hatcheries																				
3-1 Anadromous Fish			■						■				■							
3-2 Resident Fish								■					■							
4 Hydro																				
4-1 Dam Mod. & Facil								■					■							
4-2 Hydro Operations								■									■			
4-3 Spill								■					■							
4-4 Flow						■							■				■			
4-5 Reservoir Levels																				
4-6 Water Quality								■												
4-7 Juv. Fish Trans.						■							■							
4-8 Adult Fish Pass.			■										■							
4-9 Flood Control																■				
5 Power																				
5-1 Existing Gen.																				
5-2 New Energy Res.																			■	
5-3 Trans. Reliability																				
6 Industry																				
6-1 Industrial Dev.																				
6-2 Alum. and Chem.																	■			
6-3 Mining																				
6-4 Pulp and Paper																	■			
7 Transportation																				
7-1 Navigation																				
7-2 Trucking & RR																				
8 Agriculture																				
8-1 Irrigation			■			■														
8-2 Pest./Ag. Practices																				
8-3 Grazing						■														
8-4 Forestry															■					
9 Commercial Fishing																				
		■						■												
10 Resid./Comm. Dev.																				
															■		■			
11 Recreation																				
								■												
12 Tribes																				
12-1 Tribal Harvest			■					■												
12-2 Trad, Hlth, Spirit								■												

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Table F: Visual Crosswalk Between Chapter 3 Tables & Proposed Alternative Policy Directions

Key Regional Issues	Framework Concept Paper 1					Framework Concept Paper 2					Framework Concept Paper 3					Framework Concept Paper 4					Framework Concept Paper 5				
	BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]				
	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF
1 Habitat																									
1-1Anadromous Fish								■					■			■								■	
1-2 Resident Fish								■								■								■	
1-3 Introduced Species																	■								
1-4 Wildlife								■										■	■						
1-5 Pred. Anad. Fish		■																							
1-6 Watersheds		■											■						■						
1-7 Tributaries		■						■					■				■								
1-8 Mainstem Col.								■									■					■			
1-9 Reservoirs		■																							
1-10 Estuaries												■													
1-11 Water Quality		■											■					■				■			
2 Harvest																									
2-1 Anadromous Fish		■											■				■					■			
2-2 Resident Fish																									
2-3 Wildlife																									
3 Hatcheries																									
3-1 Anadromous Fish		■											■				■					■			
3-2 Resident Fish		■											■				■					■			
4 Hydro																									
4-1 Dam Mod. & Facil		■				■											■					■			
4-2 Hydro Operations													■												
4-3 Spill	■																					■			
4-4 Flow	■															■						■			
4-5 Reservoir Levels																		■							
4-6 Water Quality	■																						■		
4-7 Juv. Fish Trans.																■						■			
4-8 Adult Fish Pass.		■				■											■								
4-9 Flood Control																									
5 Power																									
5-1 Existing Gen.									■			■										■			
5-2 New Energy Res.																									
5-3 Trans. Reliability																									
6 Industry																									
6-1 Industrial Dev.												■										■			
6-2 Alum. And Chem.																									
6-3 Mining																									
6-4 Pulp and Paper																									
7 Transportation																									
7-1 Navigation																									
7-2 Trucking & RR																						■			
8 Agriculture																									
8-1 Irrigation		■										■											■		
8-2 Pest./Ag. Practices	■																■					■			
8-3 Grazing																									
8-4 Forestry																									
9 Commercial Fishing																									
		■									■						■					■			
10 Resid./Comm. Dev.																									
11 Recreation																									
			■																						
12 Tribes																									
12-1 Tribal Harvest	■												■									■			
12-2 Trad, Hlth, Spirit		■																				■			

[3] BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

Table G: Visual Crosswalk Between Chapter 3 Tables & Proposed Alternative Policy Directions

Key Regional Issues	Framework Concept Paper 6					Framework Concept Paper 7					Framework Concept Paper 8					Framework Concept Paper 9					Framework Concept Paper 10				
	BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]				
	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF
1 Habitat																									
1-1Anadromous Fish		■																			■				
1-2 Resident Fish		■																			■				
1-3 Introduced Species																									
1-4 Wildlife								■																	
1-5 Pred. Anad. Fish	■																								
1-6 Watersheds												■				■						■			
1-7 Tributaries							■				■											■			
1-8 Mainstem Col.																									
1-9 Reservoirs																									
1-10 Estuaries						■																			
1-11 Water Quality																						■			
2 Harvest																									
2-1 Anadromous Fish		■																				■			
2-2 Resident Fish																									
2-3 Wildlife																									
3 Hatcheries																									
3-1 Anadromous Fish		■															■					■			
3-2 Resident Fish																	■					■			
4 Hydro																									
4-1 Dam Mod. & Facil	■						■																		
4-2 Hydro Operations																									
4-3 Spill																									
4-4 Flow		■																							
4-5 Reservoir Levels												■													
4-6 Water Quality																						■			
4-7 Juv. Fish Trans.																									
4-8 Adult Fish Pass.																									
4-9 Flood Control												■													
5 Power																									
5-1 Existing Gen.																									
5-2 New Energy Res.							■																		
5-3 Trans. Reliability																									
6 Industry																									
6-1 Industrial Dev.																									
6-2 Alum. And Chem.																									
6-3 Mining																									
6-4 Pulp and Paper																									
7 Transportation																									
7-1 Navigation							■																		
7-2 Trucking & RR							■																		
8 Agriculture																									
8-1 Irrigation							■																		
8-2 Pest./Ag. Practices																■									
8-3 Grazing							■																		
8-4 Forestry							■									■									
9 Commercial Fishing																									
10 Resid./Comm. Dev.																									
11 Recreation																									
12 Tribes																									
12-1 Tribal Harvest												■													
12-2 Trad, Hlth, Spirit																									

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Table H: Visual Crosswalk Between Chapter 3 Tables & Proposed Alternative Policy Directions

Key Regional Issues	Framework Concept Paper 11					Framework Concept Paper 12					Framework Concept Paper 13					Framework Concept Paper 14					Framework Concept Paper 15				
	BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]				
	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF
1 Habitat																									
1-1Anadromous Fish																				■					
1-2 Resident Fish									■				■												
1-3 Introduced Species			■																						
1-4 Wildlife																									
1-5 Pred. Anad. Fish					■												■								
1-6 Watersheds																				■					
1-7 Tributaries												■							■						
1-8 Mainstem Col.																									
1-9 Reservoirs					■								■												
1-10 Estuaries																									
1-11 Water Quality								■													■				
2 Harvest																									
2-1 Anadromous Fish																			■						
2-2 Resident Fish									■				■												
2-3 Wildlife																									
3 Hatcheries																									
3-1 Anadromous Fish																				■					
3-2 Resident Fish							■												■						
4 Hydro																									
4-1 Dam Mod. & Facil					■															■	■				
4-2 Hydro Operations																									
4-3 Spill					■																				
4-4 Flow																					■				
4-5 Reservoir Levels																									
4-6 Water Quality																					■				
4-7 Juv. Fish Trans.					■																				
4-8 Adult Fish Pass.					■																■				
4-9 Flood Control					■																				
5 Power																									
5-1 Existing Gen.					■																				
5-2 New Energy Res.																									
5-3 Trans. Reliability																									
6 Industry																									
6-1 Industrial Dev.																									
6-2 Alum. And Chem.																									
6-3 Mining																									
6-4 Pulp and Paper																									
7 Transportation																									
7-1 Navigation					■																				
7-2 Trucking & RR																									
8 Agriculture																									
8-1 Irrigation					■																				
8-2 Pest./Ag. Practices																									
8-3 Grazing																									
8-4 Forestry																									
9 Commercial Fishing																									
10 Resid./Comm. Dev.																									
11 Recreation																									
12 Tribes																									
12-1 Tribal Harvest												■													
12-2 Trad, Hlth, Spirit																									

[3] BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus .

Table I: Visual Crosswalk Between Chapter 3 Tables & Proposed Alternative Policy Directions

Key Regional Issues	Framework Concept Paper 16					Framework Concept Paper 17					Framework Concept Paper 18					Framework Concept Paper 19					Framework Concept Paper 20				
	BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]				
	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF
1 Habitat																									
1-1Anadromous Fish																	■					■			
1-2 Resident Fish																									
1-3 Introduced Species																									
1-4 Wildlife																						■			
1-5 Pred. Anad. Fish																									
1-6 Watersheds				■						■															■
1-7 Tributaries				■						■													■		
1-8 Mainstem Col.			■																				■		
1-9 Reservoirs													■												
1-10 Estuaries																									
1-11 Water Quality				■						■															
2 Harvest																									
2-1 Anadromous Fish																	■					■			
2-2 Resident Fish																									
2-3 Wildlife																									
3 Hatcheries																									
3-1 Anadromous Fish																						■			
3-2 Resident Fish																					■				
4 Hydro																									
4-1 Dam Mod. & Facil																									
4-2 Hydro Operations																									
4-3 Spill																									
4-4 Flow										■															
4-5 Reservoir Levels																									
4-6 Water Quality																									
4-7 Juv. Fish Trans.																									
4-8 Adult Fish Pass.																						■			
4-9 Flood Control																									
5 Power																									
5-1 Existing Gen.																									
5-2 New Energy Res.																									
5-3 Trans. Reliability																									
6 Industry																									
6-1 Industrial Dev.																									
6-2 Alum. And Chem.																									
6-3 Mining																									
6-4 Pulp and Paper																									
7 Transportation																									
7-1 Navigation																									
7-2 Trucking & RR																									
8 Agriculture																									
8-1 Irrigation										■															
8-2 Pest./Ag. Practices																									
8-3 Grazing																									
8-4 Forestry																									
9 Commercial Fishing																									
10 Resid./Comm. Dev.																									
11 Recreation																									
																					■				
12 Tribes																									
12-1 Tribal Harvest																									
12-2 Trad, Hlth, Spirit																									

[2] BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus .

Table J: Visual Crosswalk Between Chapter 3 Tables & Proposed Alternative Policy Directions

Key Regional Issues	Framework Concept Paper 21					Framework Concept Paper 22					Framework Concept Paper 23					Framework Concept Paper 24					Framework Concept Paper 25				
	BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]					BPA Alt. Policy Dir.[1]				
	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF
1 Habitat																									
1-1Anadromous Fish							■																	■	
1-2 Resident Fish										■															
1-3 Introduced Species										■															
1-4 Wildlife										■														■	
1-5 Pred. Anad. Fish					■																				■
1-6 Watersheds							■										■								■
1-7 Tributaries													■												
1-8 Mainstem Col.																									
1-9 Reservoirs								■																	
1-10 Estuaries																									
1-11 Water Quality																				■					
2 Harvest																									
2-1 Anadromous Fish																						■			
2-2 Resident Fish								■																	
2-3 Wildlife																									
3 Hatcheries																									
3-1 Anadromous Fish							■																		■
3-2 Resident Fish							■																		■
4 Hydro																									
4-1 Dam Mod. & Facil					■																				
4-2 Hydro Operations																									
4-3 Spill																									■
4-4 Flow																									■
4-5 Reservoir Levels																									
4-6 Water Quality																									
4-7 Juv. Fish Trans.																									■
4-8 Adult Fish Pass.																									
4-9 Flood Control																									■
5 Power																									
5-1 Existing Gen.																									■
5-2 New Energy Res.																									
5-3 Trans. Reliability																									
6 Industry																									
6-1 Industrial Dev.																									
6-2 Alum. And Chem.																									
6-3 Mining																									
6-4 Pulp and Paper																									
7 Transportation																									
7-1 Navigation					■																				■
7-2 Trucking & RR																									
8 Agriculture																									
8-1 Irrigation													■												■
8-2 Pest./Ag. Pract.																									
8-3 Grazing													■												
8-4 Forestry																									
9 Commercial Fishing																									
10 Resid./Comm. Dev.																									
11 Recreation																									
																									■
12 Tribes																									
12-1 Tribal Harvest																									
12-2 Trad, Hlth, Spirit																									

[3] BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus .

Table K: Visual Crosswalk Between Chapter 3 Tables & Proposed Alternative Policy Directions

Key Regional Issues	Framework Concept Paper 26 BPA Alt. Policy Dir.[1]					Framework Concept Paper 27 BPA Alt. Policy Dir.[1]					Framework Concept Paper 28 BPA Alt. Policy Dir.[1]				
	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF
1 Habitat															
1-1Anadromous Fish					■										
1-2 Resident Fish															
1-3 Introduced Spa.					■										
1-4 Wildlife					■										
1-5 Pred. Anad. Fish					■					■					
1-6 Watersheds					■					■					
1-7 Tributaries					■					■					
1-8 Mainstem										■					
1-9 Reservoirs					■										
1-10 Estuaries										■					
1-11 Water Quality										■					
2 Harvest															
2-1 Anadromous Fish					■			■		■					
2-2 Resident Fish															
2-3 Wildlife															
3 Hatcheries															
3-1 Anadromous Fish					■					■					
3-2 Resident Fish										■					
4 Hydro															
4-1 Dam Mod. & Facil					■										
4-2 Hydro Operations					■										
4-3 Spill					■					■					
4-4 Flow					■					■					■
4-5 Reservoir Levels															
4-6 Water Quality															
4-7 Juv. Fish Trans.					■					■					
4-8 Adult Fish Pass.															
4-9 Flood Control															
5 Power															
5-1 Existing Gen.					■										
5-2 New Energy Res.															
5-3 Trans. Reliability															
6 Industry															
6-1 Industrial Dev.															
6-2 Alum. and Chem.															
6-3 Mining															
6-4 Pulp and Paper															
7 Transportation															
7-1 Navigation					■										
7-2 Trucking & RR															
8 Agriculture															
8-1 Irrigation					■					■					■
8-2 Pest./Ag. Practices										■					
8-3 Grazing										■					
8-4 Forestry										■					
9 Commercial Fishing															
										■					
10 Resid./Comm. Dev.															
11 Recreation															
										■					
12 Tribes															
12-1 Tribal Harvest										■					■
12-2 Trad, Hlth, Spirit							■								■

[2] BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus .

Table L: Suggested Review of Key Issues for Environmental Consequences

NATURAL ENVIRONMENT	
Environmental Effect	**Associated Key Issues**
Land Use	
Upland	1-6, 5-2, 5-3, 6-1, 6-2, 6-3, 8-1, 8-2, 8-3, 8-4, 10, & 11
Riparian/Wetland	1-6, 1-7, 1-8, 1-9, 1-10, 4-2, 4-5, 4-9, 6-1, 6-3, 8-1, 8-2, 8-3, 8-4, & 10
Water	
Nitrogen Supersaturation	1-11, 4-2, 4-3, & 4-6
Non-Thermal Pollution	1-11, 4-6, 6-1, 6-2, 6-3, 6-4, 8-2, 8-3, & 10
Sedimentation	1-11, 4-2, 4-5, 4-6, 8-1, 8-2, 8-3, 8-4, & 10
Temperature/Dissolved Gas	1-11, 4-2, 4-3, 4-4, 4-5, 5-1, 5-2, 6-1, 6-2, 6-4, 8-1, 8-2, & 8-4
Instream Water Quality	1-6, 1-7, 1-8, 1-11, 4-3, 4-4, 4-5, 4-9, & 8-1
Amount of River Habitat	1-7, 1-8, 1-9, 1-10, 1-11, 4-2, 4-4, 4-5, 4-9, & 8-1
Reservoir Habitat	1-3, 1-9, 1-11, 4-2, 4-5, 4-6, & 8-1
Fish & Wildlife	
Anadromous Fish	1-1, 1-3, 1-5, 1-6, 1-7, 1-8, 1-9, 1-10, 1-11, 2-1, 3-1, 4-1, 4-2, 4-3, 4-4, 4-5, 4-6, 4-7, 4-8, 4-9, 9, & 12-1
Resident Fish	1-2, 1-3, 1-6, 1-7, 1-8, 1-9, 1-11, 2-2, 3-2, 4-1, 4-2, 4-5, 4-6, 4-9, & 12-1
Wildlife	1-4, 1-6, 2-3, 5-2, 5-3, 6-1, 8-1, 8-2, 8-3, 8-4, & 11
Air Quality	5-1, 5-2, 6-1, 6-2, 6-4, 7-2, & 10
SOCIAL and ECONOMIC	
Commerce	
Commercial Interests	2-1, 2-2, 2-3, 4-2, & all of 5-9
Recreation (fishing & hunting)	All of 2, 4-5, & 11
Economic Development	3-1, 3-2, 4-1, 5-1, 5-2, 5-3, & all of 6-10

[3] BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

Tribes

Fishing Harvest	2-1, 2-2, 3-1, 3-2, 9, & 12-1
Health, Spirituality, Tradition	1-1, 1-2, 1-4, 1-6, 1-7, 1-8, 1-9, 1-11, 2-3, 3-1, 3-2, 4-5, 10, & 12-2
Cost and Funding	All of 1 & 3, 4-1, 4-2, 4-3, 4-7, 4-8, 5-2, 5-3, all of 6-9 & 11

Other

Cultural Resources	4-3, 4-4, 4-5, 5-2, 5-3, 6-1, 10, & 12-2
Aesthetics	1-4, 1-6, 1-11, 4-1, 4-2, 4-3, 4-4, 4-5, 5-2, 5-3, 6-1, 7-2, 8-1, 8-3, 8-4, 10, & 12-2

KEY

1 Habitat

1-1Anadromous Fish	1-2 Resident Fish	1-3 Introduced Species
1-4 Wildlife	1-5 Predator Anadromous Fish	1-6 Watersheds
1-7 Tributaries	1-8 Mainstem Columbia	1-9 Reservoirs
1-10 Estuary and Ocean	1-11 Water Quality	

2 Harvest

2-1 Anadromous Fish	2-2 Resident Fish	2-3 Wildlife

3 Hatcheries

3-1 Anadromous Fish	3-2 Resident Fish

4 Hydro

4-1 Dam Modifications and Facilities	4-2 Hydro Operations	4-3 Spill
4-4 Flow	4-5 Reservoir Levels	4-6 Water Quality
4-7 Juvenile Fish Migration & Transport	4-8 Adult Fish Passage	4-9 Flood Control

5 Power

5-1 Existing Generation	5-2 New Energy Resources	5-3 Transmission Reliability

6 Industry

6-1 Industrial Development	6-2 Aluminum and Chemical	6-3 Mining
6-4 Pulp and Paper		

7 Transportation

7-1 Navigation	7-2 Trucking & Railroad

8 Agriculture

8-1 Irrigation	8-2 Pest./Agricultural Practices	8-3 Grazing
8-4 Forestry		

9 Commercial Fishing

10 Residential and Commercial Development

11 Recreation

12 Tribes

12-1 Tribal Harvest	12-2 Health, Spirituality, & Tradition

[2] BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

C: Example Assessment - 2000 USFWS and NMFS Biological Opinions

This section provides an example of how to complete an assessment when building your own alternative proposal. The 2000 USFWS and NMFS Biological Opinions have been used as the examples to illustrate the assessment. To give an understanding of how the BiOps actions were dispersed across the different Policy Directions evaluated in this EIS, Table M is given below. This table first shows the where the implementing actions were placed in relationship to the Policy Directions. The other half of the table gives an illustration of where the greatest alignment of actions is in relationship to a Policy Direction. Or, in other words, which Policy Direction represents the central theme of the actions being proposed. For both of the BiOps, it is evident that the Weak Stock and Sustainable Use Policy Directions make up the core of the actions. Since the current plan under both BiOps is not to breach dams initially, the central tendency leaned toward the Sustainable Use Policy Direction. As shown, however, there are a few actions that are outside either of those Policy Directions.

The reason for describing the central tendency of the Policy Direction for the two BiOps is twofold: 1) it is easier to determine if future implementing actions are consistent with previous actions and planning goals; and 2) to ensure that expenditures are made efficiently when trying to achieve the overall objective. For example, look at the areas under habitat (1) and hydro (4). Many of the boxes representing the recommended actions are filled in across the Policy Directions. Earlier is this Appendix and in Chapter 3 we explained how being spread across too many Policy Directions could cause confusion on the part of those who must implement actions in the future. It is much more difficult to determine whether future actions are consistent with the previous actions if the overall direction is unclear. Also, consider the time and money that can be spent trying to settle disagreements over what was intended by past actions if there is not a clear Policy Direction guiding the implementation of future actions.

Following the illustrations in Table M, we used the information from Chapter 5, sections 5.2 and 5.3, to complete the assessment. Note that the shading of the different BiOps was done in the same manner of the other chapters by comparing them to the Status Quo.

[3] BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

Table M: Visual Representation of 2000 USFWS and NMFS Biological Opinions

	ACTION PLACEMENT										CENTRAL POLICY DIRECTION									
	USFWS BiOp					NMFS BiOp					USFWS BiOp					NMFS BiOp				
Key Regional Issues	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF
1 Habitat																				
1-1Anadromous Fish							■	■	■	■								■		
1-2 Resident Fish	■	■	■	■	■					■			■							■
1-3 Introduced Species																				
1-4 Wildlife		■	■	■				■					■					■		
1-5 Pred. Anad. Fish							■	■	■	■								■		
1-6 Watersheds							■	■	■	■								■		
1-7 Tributaries	■	■	■			■	■	■	■	■			■					■		
1-8 Mainstem Col.				■		■	■	■	■	■				■				■		
1-9 Reservoirs	■	■	■	■			■		■				■				■			
1-10 Estuaries						■	■	■	■	■								■		
1-11 Water Quality	■	■				■	■	■	■			■						■		
2 Harvest																				
2-1 Anadromous Fish							■		■	■							■			
2-2 Resident Fish										■										■
2-3 Wildlife																				
3 Hatcheries																				
3-1 Anadromous Fish							■	■	■	■								■		
3-2 Resident Fish		■	■							■			■							■
4 Hydro																				
4-1 Dam Mod. & Facil			■		■	■	■	■	■	■			■					■		
4-2 Hydro Operations			■					■					■					■		
4-3 Spill		■	■				■	■	■				■					■		
4-4 Flow	■	■	■			■	■	■		■			■					■		
4-5 Reservoir Levels	■	■	■	■		■	■	■	■				■					■		
4-6 Water Quality	■	■	■	■	■	■	■	■	■				■					■		
4-7 Juv. Fish Trans.		■	■		■		■	■	■	■			■					■		
4-8 Adult Fish Pass.		■	■		■		■	■	■	■			■					■		
4-9 Flood Control	■	■	■			■	■	■	■				■					■		
5 Power																				
5-1 Existing Gen.																				
5-2 New Energy Res.																				
5-3 Trans. Reliability	■	■	■			■	■	■	■				■					■		
6 Industry																				
6-1 Industrial Dev.																				
6-2 Alum. and Chem.																				
6-3 Mining																				
6-4 Pulp and Paper																				
7 Transportation																				
7-1 Navigation																				
7-2 Trucking & RR																				
8 Agriculture																				
8-1 Irrigation						■	■	■	■	■								■		
8-2 Pest./Ag. Practices										■										■
8-3 Grazing																				
8-4 Forestry																				
9 Commercial Fishing																				
							■		■								■			
10 Resid./Comm. Dev.																				
								■	■	■								■		
11 Recreation																				
12 Tribes																				
12-1 Tribal Harvest							■			■							■			
12-2 Trad, Hlth, Spirit								■										■		

[2] BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

Environmental Consequences Assessment

Effect Subcategory	Status Quo	NMFS & USFWS 2000 Biological Opinions
Air Quality		
CO		
CO2		
Nox		
PM10		
Sox		

EXPLANATION:

Air emissions may increase from operation changes causing the need for additional combustion turbines to replace any lost peaking capability. The air quality is expected to be degraded a small amount more than under Status Quo. If breaching or drawdown were needed in the long- term, the change in air emissions would considerably increase from the replacement power for lost hydropower and the prolonged operation of existing thermal resources. The air quality effects would be worse than under Status Quo, similar to the Weak Stock Focus.

EXAMPLES:

Should the current power emergency on the West Coast persist, the temporary water management actions foreseen by the BO, may cause a reevaluation of the policy direction or yield to new generation.

The Action Agencies shall operate FCRPS dams and reservoirs with the intent of meeting the flow objectives (Table 9.6-1) on both a seasonal and weekly average basis for the benefit of migrating juvenile salmon. (NMFS Biological Opinion Action Table Dec. 2000)

BPA's Transmission Business Line shall continue to evaluate strategically located generation additions and other transmission system improvements and report progress to NMFS annually. BPA's Transmission Business Line shall also limit future reservations for transmission capacity, as needed, to enable additional spill to meet performance standards, while minimizing effects on transmission rights holders. (NMFS Biological Opinion 2000 Action Table Dec. 2000)

[3] BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

Land Habitat		
Upland habitat quality		
Upland habitat amount		
Riparian/ wetland habitat quality		
Riparian/ wetland habitat amount		

EXPLANATION:

Immediate, substantial human intervention to preserve and restore lost habitat for weak native stocks, especially in areas designated critical habitat for threatened or endangered species. Mostly active and some passive habitat restoration used to obtain habitat features for weak stocks. Overall, much more habitat for weak native ESA listed species, and some habitat for non-listed species would be preserved and restored.

EXAMPLES:

- The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for habitat measures that provide offsite mitigation. (NMFS Biological Opinion Action Table Dec. 2000).
- The Action Agencies shall coordinate their efforts and support offsite habitat enhancement measures undertaken by other Federal agencies, states, Tribes, and local governments by the following: (See RPA) (FFCRPS Biological Opinion 2000 Action Table).
- In subbasins with listed salmon and steelhead, BPA shall fund protection of currently productive non-Federal habitat, especially if at risk of being degraded, in accordance with criteria and priorities BPA and NMFS will develop by June 1, 2001. (NMFS Biological Opinion 2000 Action Table Dec. 2000).
- BPA shall, working with agricultural incentive programs such as the Conservation Reserve Enhancement Program, negotiate and fund long-term protection for 100 miles of riparian buffers per year in accordance with criteria BPA and NMFS will develop by June 1, 2001. (NMFS Biological Opinion 2000 Action Table Dec. 2000)
- BPA shall fund actions to improve and restore tributary and mainstem habitat for CR chum salmon in the reach between The Dalles Dam and the mouth of the Columbia River. (NMFS Biological Opinion 2000 Action Table Dec. 2000)

OTHER CONSIDERATIONS:

Due to the loss of available hydropower the need for new generation and transmission would accelerate planned development having some increase over Status Quo. The effects of building new generation and transmission would have land impacts that offset some of the habitat gains above. Overall the change in land habitat would be about the same as Status Quo, If breaching or drawdown occur in the future, the effects would lead to substantial trade-offs of land habitat for aquatic habitat leaving the overall land habitat worse than under Status Quo..

EXAMPLES:

- To improve the future flexibility of the transmission system, BPA's Transmission Business Line shall initiate planning and design necessary to construct a Schultz-Hanford 500-kV line or an equivalent project, with a planned schedule for implementation by 2004 or 2005. (NMFS Biological Opinion Action Table Dec. 2000)
- BPA's Transmission Business Line shall continue efforts to evaluate, plan, design, and construct a joint transmission project to upgrade the west-of-Hatwai cutplane and improve the transfer limitations from Montana. (NMFS Biological Opinion Action Table Dec. 2000).

[2] BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

Water Habitat		
Nitrogen Supersaturation		

EXPLANATION:
Spill and flow regimes would be balanced with local clean water standards. Nitrogen supersaturation, a problem even with improvements, would not be significantly better than Status Quo.

EXAMPLES:

- The Corps and BPA shall implement an annual spill program, consistent with the spill volumes and TDG limits identified in Table 9.6-3, at all mainstem Snake and Columbia River FCRPS projects as part of the annual planning effort to achieve the juvenile salmon and steelhead performance standards. (NMFS Biological Opinion 2000 Action Table Dec. 2000)
- The Corps shall complete its DGAS by April 2001. The results of this study will be used to guide future studies and decisions about implementation of some long-term structural measures to reduce TDG. (NMFS Biological Opinion 2000 Action Table Dec. 2000)
- The Action Agencies shall monitor the effects of TDG. This annual program shall include physical and biological monitoring and shall be developed and implemented in consultation with the Water Quality Team and the Mid-Columbia PUDs' monitoring programs. (NMFS Biological Opinion 2000 Action Table Dec. 2000)

Non-thermal Pollution		

EXPLANATION:
Increase enforcement of water quality standards for pollutants in critical habitat of weak stocks. Riparian land acquisition and active restoration would reduce up-slope non-point contribution. Use positive incentives, monitoring and enforcement to reduce point and non-point pollution.

Examples:
BOR shall evaluate the water quality characteristics of each point of surface return flows from the Columbia Basin Project to the Columbia River and estimate the effects these return flows may have on listed fish in the Columbia River and in the wasteways accessible to listed fish. By June 1, 2001, BOR shall provide NMFS with a detailed water quality monitoring plan, including a list of water quality parameters to be evaluated. If the water quality sampling reveals enough water quality degradation to adversely affect listed fish, BOR shall develop and initiate implementation of a wasteway water quality remediation plan within 12 months of the completion of the monitoring program. (NMFS Biological Opinion Action Table Dec. 2000)

Sedimentation		

EXPLANATION:
No breaching in the short-term. Water erosion and sedimentation reduced throughout the basin as part of balanced and more active land use management.

Examples:

- The Action Agencies, in coordination with NMFS, USFWS, and other Federal agencies, Northwest Power Planning Council, states, and Tribes, shall develop a common data management system for fish populations, water quality, and habitat data (NMFS Biological Opinion Action Table Dec. 2000).

[3] BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

- The action agencies will work with FWS and Montana Department of Fish, Wildlife, and Parks to re-establish appropriate vegetation in the 20 foot drawdown zone of Hungry Horse Reservoir. A schedule should be developed for plans and funding to be secured by 2003, with implementation by 2005. (FWS Biological Opinion Dec. 2000)

Temperature/ Dissolved Oxygen		

EXPLANATION:
Overall, temperature and dissolved gas would likely be about the same as Status Quo or slightly better.

EXAMPLES:

- By June 30, 2001, the action agencies shall develop and coordinate with FWS, NMFS and EPA on a plan to model the water temperature effects of alternative Snake River operations, including Libby and Hungry Horse Dams. The modeling plan shall include a temperature data collection strategy developed in consultation with EPA, NMFS, and State and Tribal water quality agencies. The data collection strategy shall be sufficient to develop and operate the model and to document the effects of the project operations. (FWS Biological Opinion Dec. 2000)
- The Corps and BPA shall implement an annual spill program, consistent with the spill volumes and TDG limits identified in Table 9.6-3, at all mainstem Snake and Columbia River FCRPS projects as part of the annual planning effort to achieve the juvenile salmon and steelhead performance standards. (NMFS Biological Opinion Action Table Dec. 2000)
- The Action Agencies shall monitor the effects of TDG. This annual program shall include physical and biological monitoring and shall be developed and implemented in consultation with the Water Quality Team and the Mid-Columbia PUDs' monitoring programs. (NMFS Biological Opinion Action Table Dec. 2000)

Instream Water Quantity		

EXPLANATION:
Water withdrawals reduced primarily through management and positive incentives.

EXAMPLES:

- The Action Agencies shall develop a plan to conduct a systematic review and evaluation of the TDG fixed monitoring stations in the forebays of all the mainstem Columbia and Snake river dams (including the Camas/Washougal monitor). The evaluation plan shall be developed by February 2001 and included as part of the first annual water quality improvement plan. The Action Agencies shall conduct the evaluation and make changes in the location of fixed monitoring sites, as warranted, and in coordination with the Water Quality Team. It should be possible to make some modifications by the start of the 2001 spill season. (NMFS Biological Opinion Action Table Dec. 2000)

Amount of Stream/River Habitat		

EXPLANATION:
About the same as Status Quo because no major changes in river management.

EXAMPLES:

- BPA, working with BOR, the Corps, EPA, and USGS, shall develop a program to 1) identify mainstem habitat sampling reaches, survey conditions, describe cause-and-effect relationships, and identify research needs; 2) develop improvement plans for all mainstem reaches; and 3) initiate

[2] BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

improvements in three mainstem reaches. Results shall be reported annually. (NMFS Biological Opinion Action Table Dec. 2000)

- BOR shall pursue water conservation improvements at its projects and shall use all mechanisms available to it under state and Federal law to ensure that a reasonable portion of any water conserved will benefit listed species. (NMFS Biological Opinion 2000 Action Table Dec. 2000)

Reservoir Habitat		

EXPLANATION:
About the same as Status Quo because no major changes in reservoir habitat would occur.

EXAMPLES:

- The Action Agencies shall operate the FCRPS during the fall and winter months in a manner that achieves refill to April 10 flood control elevations, while meeting project and system minimum flow and flood control constraints before April 10. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30. (NMFS Biological Opinion 2000 Action Table Dec. 2000)
- The Corps and BOR shall implement VARQ flood control operations, as defined by the Corps (1999d), at Libby by October 1, 2001, and at Hungry Horse by January 1, 2001. By February 1, 2001, the Corps shall develop a schedule to complete all disclosures, NEPA compliance, and Canadian coordination necessary to implement VARQ flood control at Libby. (NMFS Biological Opinion Action Table Dec. 2000)
- BOR shall operate Banks Lake at an elevation 5 feet from full during August by reducing the volume of water pumped from Lake Roosevelt into Banks Lake by about 130 kaf during this time. (NMFS Biological Opinion Action Table Dec. 2000)

Fish and Wildlife		
Natural Spawning Native Anadromous Fish		
Hatchery Produced Native Anadromous Fish		

EXPLANATION:
Full potential unknown; limited by existing dams and lack of spawning habitat. Population sizes vary substantially due to natural and human-caused factors. Harvest and hatcheries would be controlled to accommodate changes in population status. Less hatchery production and harvest overall. Natural and hatchery fish would increase with habitat, hatchery and harvest improvements.

EXAMPLES:

- In subbasins with listed salmon and steelhead, BPA shall fund protection of currently productive non-Federal habitat, especially if at risk of being degraded, in accordance with criteria and priorities BPA and NMFS will develop by June 1, 2001. (NMFS Biological Opinion Action Table Dec. 2000)
- The Action Agencies shall continue to fund studies that monitor survival, growth, and other early life history attributes of Snake River wild juvenile fall chinook. (NMFS Biological Opinion 2000 Action Table Dec. 2000)

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- The Action Agencies shall determine the number of adults passed through turbines, then, if warranted, investigate the survival of adult salmonid passage through turbines (including steelhead kelts). (NMFS Biological Opinion Action Table Dec. 2000)
- The Action Agencies shall conduct a comprehensive evaluation to assess survival of adult salmonids migrating upstream and factors contributing to unaccounted losses. (NMFS Biological Opinion Action Table Dec. 2000)

- The Corps, in coordination with USFWS, shall design and implement appropriate repairs and modifications to provide water supply temperatures for the Dworshak National Fish Hatchery that are conducive to fish health and growth, while allowing variable discharges of cold water from Dworshak Reservoir to mitigate adverse temperature effects on salmon downstream in the lower Snake River. (NMFS Biological Opinion Action Table Dec. 2000)
- The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for hatchery and harvest measures that provide offsite mitigation. (NMFS Biological Opinion Action Table Dec. 2000)

Native Resident Fish		

EXPLANATION:
Emphasis remains on listed species, but non-listed native fish benefit from habitat and hydrosystem actions.

EXAMPLES:

- The action agencies shall regulate flows from Libby Dam to achieve water volumes, water velocities, water depths, and water temperature at a time to maximize the probability of allowing significant [Kootenai River white] sturgeon recruitment. (FWS Biological Opinion Dec. 2000)
- Implement VarQ flood control/storage at Libby Dam by October 2001. (FWS Biological Opinion Dec. 2000)
- During water year 2001, (October 1, 2000 - September 30, 2001) the action agencies shall store water and supply, at a minimum, water volumes during May, June and July based upon a water availability or "tiered" approach (in addition to storage needs for listed bull trout, salmon, and the 4,000 cfs minimum releases from Libby Dam) to enhance survival of [Kootenai River white Sturgeon] eggs, yolk sac larvae, or larvae reared under the preservation stocking program and released into the Kootenai River. (FWS Biological Opinion Dec. 2000)

Non-native species		

EXPLANATION:
Emphasis remains on listed species. Non-native fish are actively managed and reduced to benefit listed species.

EXAMPLES:

- The Action Agencies shall continue to implement and study methods to reduce the loss of juvenile salmonids to predacious fishes in the lower Columbia and lower Snake rivers. This effort will include continuation and improvement of the ongoing Northern Pikeminnow Management Program and evaluation of methods to control predation by non-indigenous predacious fishes, including smallmouth bass, walleye, and channel catfish. (NMFS Biological Opinion 2000 Action Table Dec. 2000)

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Native Wildlife		

EXPLANATION:
Needs of the listed species balanced against the needs of all species. More habitat, better management. Approach should benefit wildlife species more than status quo.

EXAMPLES:

- The action agencies will work with FWS and Montana Department of Fish, Wildlife, and Parks to re-establish appropriate vegetation in the 20 foot drawdown zone of Hungry Horse Reservoir. A schedule should be developed for plans and funding to be secured by 2003, with implementation by 2005. (FWS Biological Opinion Dec. 2000)
- The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for habitat measures that provide offsite mitigation. (NMFS Biological Opinion Action Table Dec. 2000)

Commercial Interests

Power		

EXPLANATION:
Limits on generation at existing facilities. Use flow, spill, drawdowns, peak efficiency turbine operation, and facility modifications to improve in-river juvenile salmon survival; avoid fluctuations caused by power peaking operations. Some hydropower losses compared to Status Quo.

EXAMPLES:

- The Action Agencies shall operate FCRPS dams and reservoirs with the intent of meeting the flow objectives (Table 9.6-1) on both a seasonal and weekly average basis for the benefit of migrating juvenile salmon. (NMFS Biological Opinion Action Table Dec. 2000)

Transmission		

EXPLANATION:
Important transmission improvements required.

EXAMPLES:

- To improve the future flexibility of the transmission system, BPA's Transmission Business Line shall initiate planning and design necessary to construct a Schultz-Hanford 500-kV line or an equivalent project, with a planned schedule for implementation by 2004 or 2005. (NMFS Biological Opinion Action Table Dec. 2000)
- BPA's Transmission Business Line shall continue efforts to evaluate, plan, design, and construct a joint transmission project to upgrade the west-of-Hatwai cutplane and improve the transfer limitations from Montana. (NMFS Biological Opinion Action Table Dec. 2000).
- The action agencies shall seek redundancy in transformers at Libby Dam to assure that sturgeon flows can be released. Loss of one transformer can result in the loss of use of two turbines, or 10,000 cfs of release capacity. (FWS Biological Opinion Dec. 2000)

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Transportation		

EXPLANATION:
As there would be no immediate breaching, navigational effects would be delayed possibly indefinitely. Some increases in other transportation costs.

Agriculture and Forestry		

EXPLANATION:
Land retirement, land management, technology applied to make agricultural and forestry practices more compatible with fish and wildlife. Some land retirement used where cost-effective. Not clear to what extent costs paid by landowners, ratepayers or taxpayers. Overall, similar to status quo.

EXAMPLES:

- BPA shall, working with agricultural incentive programs such as the Conservation Reserve Enhancement Program, negotiate and fund long-term protection for 100 miles of riparian buffers per year in accordance with criteria BPA and NMFS will develop by June 1, 2001. (NMFS Biological Opinion 2000 Action Table Dec. 2000)
- By December 1, 2001, the action agencies shall quantify the effects of groundwater seepage associated with the magnitude and duration of sturgeon flows on crops in the Kootenai Valley relative to all other types high flow/stage events which occur in the Kootenai River. The effects of direct precipitation and runoff from small tributaries within the Kootenai Valley on both surface and ground water levels shall also be accounted for in this study. This shall include delineation of specific sites affected and identification of all feasible remedies specific to those sites such as, drainage, willing seller land purchases, and enrollment in the Department of Agriculture's Wetland Reserve Program. (FWS Biological Opinion Dec. 2000)

Commercial Fish Harvest		

EXPLANATION:
Continued restrictions on any commercial harvest that may further endanger weak stocks. Possible increased harvest of other stocks as they recover. Increase in targeted/selective harvest. Direct harvest toward hatchery fish and away from healthier wild stocks. Overall, commercial value may increase relative to Status Quo.

EXAMPLES:

- The Action Agencies shall work with NMFS, USFWS, and Tribal and state fishery management agencies in a multiyear program to develop, test, and deploy selective fishing methods and gear that enable fisheries to target non-listed fish while holding incidental impacts on listed fish within NMFS-defined limits. The design of this program and initial implementation (i.e., at least the testing of new gear types and methods) shall begin in FY 2001. Studies and/or pilot projects shall be under way and/or methods deployed by the 3-year check-in. (NMFS Biological Opinion 2000 Action Table Dec. 2000)

Other industry (esp. mining, forest products, DSIs)		

EXPLANATION:
Industries affected by more expensive and slightly less reliable electricity. Incentives for environmentally friendly industry and development. Mine site active restoration. Increase in services and government employment to implement intensive programs. Overall effects are adverse.

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Recreation		
Sport Fishing and Wildlife Harvest		

EXPLANATION:
Restrict methods that risk further degrading weak fish and wildlife species. Promote harvest of non-native species. Manage harvests for ecosystem benefits. Economic benefits to sport fishing and hunting industries may be better than status quo.

Other Recreation		

EXPLANATION:
Actions to assist weak stocks will consider means to accommodate recreational needs. Other outdoor recreation might benefit from land acquisitions and management for habitat. Overall, about the same as Status Quo, but many losers and winners.

Economic Development		
Industrial, Residential & Commercial Development		

EXPLANATION:
Encourage and promote development more compatible with fish and wildlife habitat. About the same as Status Quo

Employment		

EXPLANATION:
Some loss through increased power costs, increased taxes and subsequently, reduced discretionary income. Employment benefit of new power capacity construction would come sooner than status quo. Increased employment in agricultural and forestry services associated with land management. Commercial fishing effects negative initially, positive later. Overall, decreased employment in sectors where power consumers and agriculture spend and increased employment where natural resource and land management services spend. Employment effects about neutral overall.

Tribes		
Fish Harvest		

EXPLANATION:
Tribal harvest would be allowed as long as weak stocks were not negatively affected.

EXAMPLES:

- The Action Agencies shall work with NMFS, USFWS, and Tribal and state fishery management agencies in a multiyear program to develop, test, and deploy selective fishing methods and gear that enable fisheries to target non-listed fish while holding incidental impacts on listed fish within NMFS-defined limits. The design of this program and initial implementation (i.e., at least the testing of new gear types and methods) shall begin in FY 2001. Studies and/or pilot projects shall be under way

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and/or methods deployed by the 3-year check-in. (NMFS Biological Opinion 2000 Action Table Dec. 2000)

Health		
Spirituality		
Tradition		

EXPLANATION
Some tribes would benefit from increased utilization opportunities, especially downriver. Upriver stocks may not be improved as much, but upriver fish and wildlife opportunities should increase overall. Reservation employment opportunities associated with active restoration might increase. Overall, more opportunities than Status Quo.

Costs and Funding		
Ratepayers		

EXPLANATION:
Additional fish recovery costs paid by ratepayers. Power rates would rise, but at slower pace than Weak Stock Focus. Amount of cost passed to ratepayers could be limited by maximum sustainable revenue. Adverse effects on ratepayers.

Federal Taxpayers		
States		
Private/Commercial		

EXPLANATION:
An increase in federal funding relative to Status Quo. Greater likelihood that the ratepayers and the region would be able to finance their share of the additional expenditures. Adverse effect compared to Status Quo.

Other		
Cultural/Historical Resources		

EXPLANATION:
Similar to Status Quo. Some historical structures might be removed.

Aesthetics		

EXPLANATION:
Little exposure of reservoir bottoms, but maybe more than Status Quo. More land in native vegetation. About the same as Status Quo.

[2] BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

Appendix J

TYPICAL ENVIRONMENTAL CONSEQUENCES OF POTENTIAL IMPLEMENTATION ACTIONS

The following two tables provide estimates of many of the environmental consequences of potential fish and wildlife mitigation actions and program activities. The actions and activities could be implemented to benefit fish and wildlife under one or more of the alternative Policy Directions considered in this document. It should be noted that these are sample implementation actions and effects only; that is, the list is not intended to be all inclusive.

Most of the information has been developed through attempts in other EISs and fish and wildlife documents to quantify the environmental consequences using appropriate units and measures. In many cases, ranges of values provide the best available estimates for activities with varying outputs and costs. The estimates should be used for comparative purposes only; actual consequences of individual projects may vary and are expected to change over time.

The actions and activities are aligned with the major categories of environmental consequences considered in Chapter 5 of this DEIS to make it easier to cross reference.

- Table A provides estimates of fish and wildlife benefits that could result from potential implementation actions. The table also provides typical social and economic costs that could accrue from the implementation actions.
- Table B gives the typical impacts from alternative methods of energy generation that could affect air, land, and water.

The estimated environmental consequences of sample actions and activities are useful for those who may want to build their own Policy Direction alternative. The intent of this Appendix is to provide the reader with information to better understand the tradeoffs among program elements.

NOTE: All dollar values are economic costs. Most of the values are based on information in the Northwest Power Planning Council's *Human Effects Analysis of the Multi-Species Framework Alternatives* (March 2000). That analysis was itself based on secondary information from recent environmental, economic, and policy analyses in the region. A range is provided where estimates were provided for more than one location, or where multiple references were available. Many of the estimates were derived from research conducted for the Lower Snake River Juvenile Migration Feasibility Study.

Cost information in the tables pertains to the costs of fish and wildlife recovery and mitigation actions. Most hydrosystem costs are expressed as the cost per dam affected. Costs are expressed in terms of their one-time cost and the annualized equivalent. The annual equivalent was calculated assuming 4.75 percent real interest. Payment periods vary depending on the type of action, but are generally 50 years or longer. Most hydrosystem data are from the Lower Snake River Juvenile Migration Feasibility Study, the John Day feasibility study, and from federal planning documents.

Most habitat cost data are based on costs of agricultural and forestry practices provided by the USDA. Some habitat cost estimates are based on costs of projects funded by BPA. Cost data are generally expressed as cost per acre, though cost per mile is generally more appropriate for stream restoration practices. Cost per project is used where no better physical measure is possible.

Hatchery cost data are available from federal sources, and statistical summaries of these data yield cost per pound of fish produced. The range of costs may reflect the age and size of fish produced, different species, and different operators. Costs of actions to reduce harvest are generally based on lost net revenues in the fishing industry, but costs of targeted fisheries can be based on the costs of implementing the new practices.

The air, land, and water data came mainly from the BPA Business Plan FEIS and Resource Programs FEIS. The additional data on diesels and simple cycle combustion turbines was within the range of effects information provided in the BPEIS and has specifically been noted below to help the reader more easily see the effects.

Table A - Typical Fish and Wildlife Social and Economic Consequences, of Implementation Actions.

Action/Activity	Environmental Effect	Annualized Environmental Effect	Unit of Measure	Reference
Social and Economic				
Agriculture, Crop Switching on Irrigated Land		50-100	$ cost/acre irrigated	
Agriculture, Crop Management (modified cultivation practices, conservation tillage, no-till agriculture, development of small ponds to retain water)	Not quantified, Potentially major		$ cost/acre managed	
Agriculture, Erosion Management on Dry Land		10-30	$ cost/acre managed	USDA 1996a, 1997
Agriculture, Fallow Irrigated Land		100-300	$ cost/acre fallow	
Agriculture, Irrigation Water Management		10-100	$ cost/acre irrigated	USDA 1996a, 1997
Agriculture, Nutrient/Pesticide Management: Irrigated Land		5-40	$ cost/acre managed	USDA 1996a, 1997
Agriculture, Nutrient/Pesticide Management: Dry Land		5-10	$ cost/acre managed	USDA 1996a, 1997
Agriculture, Retire Irrigated Land	2,000-5,000	95-240	$ cost/acre retired	

Table A - Typical Fish and Wildlife Social and Economic Consequences, of Implementation Actions.

Action/Activity	Environmental Effect	Annualized Environmental Effect	Unit of Measure	Reference
Agriculture, Retire Dry Land/Convert to Native Vegetation	500-1,000	25-50	$ cost/acre retired	
Agriculture, Screen Irrigation Diversions		5-47	$ cost/cfs diversion capacity screened	USDA 1996b
Dam Breach Mainstem: Hydropower Loss		55-66 (Lower Snake Dams) 215-250 (John Day)	Million $ cost/dam breached	USACE 1999a, 1999c
Dam Breach Mainstem: Implementation	202(Lower Snake Dams); 2,500 (John Day)	10 (Lower Snake Dams); 120 (John Day)	Million $ cost/dam breached	USACE 1999a, 1999b
Dam Breach Mainstem: Increased Transmission Cost	120-144 (Lower Snake Dams)	5-6 (Lower Snake Dams)	Million $ cost/dam breached	USACE 1999a
Dam Breach Mainstem: Facilities Cost Savings		Some dam modification costs would be avoided by breaching if the costs would be required for the dams that are breached	Million $ cost saved by breaching	
Dam Breach Mainstem: Navigation Loss		25 (4 Lower Snake Dams); 95 (John Day)	Million $ loss/group of dams) breached	USACE 1999a, 1999b
Dam Breach Mainstem: Operations and Maintenance Cost Savings		34(4 Lower Snake Dams); 10 (John Day); 10 (McNary)	Million $ cost saved by breaching	Anderson 1999
Dam Breach Mainstem: Other Recreation Loss		8 (Lower Snake Dams)	million $ cost/dam breached	USACE 1999a, 1999d
Dam Breach Mainstem: Recreational Fishing Loss		0.4 (Lower Snake Dams)	million $ cost/dam breached	USACE 1999a, 1999d

Table A - Typical Fish and Wildlife Social and Economic Consequences, of Implementation Actions.

Action/Activity	Environmental Effect	Annualized Environmental Effect	Unit of Measure	Reference
Dam Breach Mainstem: Water Supply (Irrigation) Reduction	50-61 (Lower Snake Dams) 370 (John Day); 400 (McNary)	2 (Lower Snake Dams); 20 (John Day 20 (McNary)	million $ cost/dam breached	USACE 1999a, 1999b
Dam Breach Tributary: Hydropower Loss (Net of Expected Costs)		About zero	million $cost/dam	
Dam Breach Tributary: Implementation Costs	10-20	0.5-1.0	million $ cost/dam	CBB 1999a
Dam Modification: Change Dam Operations (Spills and Flows)		Depends on specifications; Changes in power, recreation, flood control, and water supply may be important		
Dam Modification: Dissolved Gas and Temperature Control	5-32	0.3-2.1	million $ cost/dam modified	Anderson 1999
Dam Modification: Other Juvenile Transport and Bypass System Improvements	5-116	0.3-5.8	Million $ cost/dam modified	Anderson 1999
Dam Modification: Surface Bypass Systems	50-250	2.6-13	Million $ cost/dam modified	Anderson 1999
Dam Modification: Turbine Improvements	2-10	0.1	Million $ cost/turbine rehabilitated (Each dam has 6-22 turbines)	Kranda 1999

Table A - Typical Fish and Wildlife Social and Economic Consequences, of Implementation Actions.

Action/Activity	Environmental Effect	Annualized Environmental Effect	Unit of Measure	Reference
Education, Public Environmental	1,000-100,000		$ cost/educational event	
Enforcement, Fish and Wildlife Regulations	25,000-60,000		$ cost/person/year	
Forestry, Controlled Burn	25-56	3-6	$ cost/acre treated	ICBEMP 2000; USDA 1996c
Forestry, Eliminate Timber Harvest	125-1,500	6-71	$ cost/acre not harvested	ICBEMP 1997; USDA 1996c
Forestry, Limit Size of Clearcuts	<125-1,500	<6-71	$ cost/acre of deferred harvested	ICBEMP 1997; USDA 1996c
Forestry, Reforestation	300-500	15-24	$ cost/acre reforested	USDA 1996c
Forestry, Shelterwood/ Group Selection Harvest	50-100 + net on deferred timber harvest	56-130	$ cost/acre treated	ICBEMP 1997
Forestry, Thinning	81		$ cost/acre thinned	ICBEMP 2000
Habitat Improvement, Active Meander Restoration	10,000–100,000	475– 4,750	$ cost/acre restored	BPA 1999
Habitat Improvement, Channel Modification (Substrate, configuration, reconnect side channels, etc.)	9,000–100,000	475– 4,750	$ cost/mile of stream modified	BPA 1999; ICBEMP 2000
Habitat Improvement, Construct/Restore Wetlands	2,000-10,000	100– 470	$ cost/acre constructed	USDA 1996b

Table A - Typical Fish and Wildlife Social and Economic Consequences, of Implementation Actions.

Action/Activity	Environmental Effect	Annualized Environmental Effect	Unit of Measure	Reference
Habitat Improvement, Dike Removal in Estuary	Not quantified, potentially significant		$ cost/mile of dike removed	
Habitat Improvement, Floodplain Structure Buyback			$ cost/property purchased	
Habitat Improvement, Instream Structures	30,000	1,425	$ cost/mile of stream modified	BPA 1999
Habitat Improvement, Monitoring (Improve environmental data management systems)		25,000-60,000	$ cost/person/year	
Habitat Improvement, Reconnect Aquatic Habitats	9,000–100,000	475– 4,750	$ cost/project	BPA 1999; ICBEMP 2000
Habitat Improvement, Remove Passage Obstruction (Culverts, low-head dams, weirs)	5,000-50,000	240–2,400	$ cost/obstruction removed	BPA 1999
Habitat Improvement, Research	10,000-300,000		$ cost/research project	
Habitat Improvement, Riparian Restoration	300		$ cost/acre of riparian area improved	ICBEMP 2000
Habitat Improvement, Road Management (Upgrades, maintenance, closing, and removing roads)	5,800		$ cost/mile of road treated	ICBEMP 2000

Table A - Typical Fish and Wildlife Social and Economic Consequences, of Implementation Actions.

Action/Activity	Environmental Effect	Annualized Environmental Effect	Unit of Measure	Reference
Habitat Improvement, Utility and Transportation Corridors (Adjust vegetation management and maintenance)	Not quantified, potentially significant		$ cost/mile of corridor adjusted	
Habitat Improvement, Water Rights Purchase (1 Million Acre-Feet of Water from Upper Snake River)		75–85	Million $ total cost	BOR 1999
Habitat Improvement, Wildlife Habitat (Seral stages, snags, downed wood, large trees, and preferred species)	44	2.3	$ cost/acre treated	ICBEMP 2000
Hatcheries, Construct New Facilities	20-40	1-2	Million $ cost/hatchery	Radtke & Davis 1997
Hatcheries, Demolition/ Decommissioning	50,000-200,000	2.6-10.5	Thousand $ cost/hatchery	
Hatcheries, Increase Fish Production in Existing Facilities		2-6	$ cost/pound of smolts	Radtke & Davis 1997
Hatcheries, Increase Fish Production in New Facilities (including O&M)		7-10	$ cost/pound of smolts	Radtke & Davis 1997
Power, Build Replacement Generation Facilities	Varies, may be significant	Varies, may be significant	$ / aMW	

Table A - Typical Fish and Wildlife Social and Economic Consequences, of Implementation Actions.

Action/Activity	Environmental Effect	Annualized Environmental Effect	Unit of Measure	Reference
Power, New Transmission Line Right-of-Way	2.7-4.4		ha dedicated to ROW/km of transmission line	BPA 1993
Rangeland, Exclude Grazing from Riparian Zone		10-20	$ cost/acre excluded	USDA 1996a
Rangeland, Improvements/Restoration	50		$ cost/acre treated	ICBEMP 2000
Rangeland, Manage/ Eliminate Grazing (Seasonal or rotational grazing, reduced grazing intensity, deferred grazing)		1-5	$ cost/acre excluded	USDA 1996b
Rangeland, Noxious Weed Treatments	30	2.4	$ cost/acre treated	ICBEMP 2000
Rangeland, Retire Rangeland	100-500	5-47	$ cost/acre retired	USDA 1996a, 1996b, 1997
Recreation, Controlled Recreation Intensity or Rotational Use	Varies, may be significant			
Recreation, Relocate Facilities Away from Sensitive Habitats	125-1,500	6-71	$ cost/acre not used	
Recreation, River (Floating, viewing, hiking)	71-297		$/river trip	Loomis 1999 in USACE 1999a

Table A - Typical Fish and Wildlife Social and Economic Consequences, of Implementation Actions.

Action/Activity	Environmental Effect	Annualized Environmental Effect	Unit of Measure	Reference
Urban and Rural Development, Acquisition of Conservation Easements	1-100	.05-47	Thousand $/acre of easement acquired	
Urban and Rural Development, Improve Stormwater Treatment	1,000 - 3,000	50 – 150	$ cost/acre-foot of water treated	
Urban and Rural Development, Improve Wastewater Treatment	0.01-10	0.0005-.5	Million $/project	

Table B - Typical Impacts to Air, Land, and Water from Alternative Methods of Energy Generation.

Types of Energy Conservation and Generation	Air Emissions						Water Consumed	Land Area Consumed
	SO_2	NO_X	CO_2	Particulates	CO	PAHs	--yd^3/aMW--	--ac./aMW--
	-- tons/aMW --							
Energy Conservation[a]	0.0	0.0	0	0.0	0.0		0	0.0
Power Efficiency Improvements[a]	0.0	0.0	0	0.0	0.0		0	0.0
Renewable Energy[a]								
Geothermal	0.8 H_2S	0.0	636	0.0	0.0		72,277	0.3
Solar	0.0	0.0	0	0.0	0.0		629	6.0
Wind	0.0	0.0	0	0.0	0.0		0	23.6
Hydro	0.0	0.0	0	0.0	0.0		0	0.0
Cogeneration[a]								
Solid Waste-Fired	13.6	70.2	13,256	3.0	2.7	+	0	2.0
Wood-Fired	0.5	9.0	11,959	1.7	17.0	+	87,604	2.6
Existing Natural Gas-Fired	0.0	5.3	3,542	0.0	2.0	+	5,486	0.2
Natural Gas Combustion Turbine[ab]								
Older	0.0-43.9	4.6-15.0	3,542-5,142	0.0-0.3	0.7-3.8	+	5,486	0.2
Newer	0.0-0.3	0.4-4.9	3,313	0.2	0.1-5.9	+	5,486	0.2
Natural Gas Reciprocating Engines (with NOx control) [b]	0.0	1.3-2.5	--	1.1-1.2	3.7-3.8	+	--	--
Large Stationary Diesel Engines[c]	1.9-47.2		7,713	1.4-4.7	2.5-39.7	+	--	--
Without NO_X Control		149.6						
With NO_X Control		14.3-88.8						
Stationary Dual Fuel (5% diesel, 95% natural gas uncontrolled for NOx) Engines[c]	0.2	105.5	--	--	44.2	+	--	--
Nuclear Energy[a]	0.0	0.0	0	0.0	0.0		25,814	2.2
Coal[a]								
Common	8.6	21.6	8,843	1.3	1.5	+	17,247	1.3
Clean Fluidized-Bed Coal	3.1	5.3	8,052	0.6	1.4	+	26,507	1.6
Clean Gasification Coal	1.5	3.9	7,551	0.2	0.1	+	26,232	0.7
Fuel Switching (Gas water heaters and furnaces)[a]	0.0	2.4	2,550	0.0	1.1	+	0	0.0
Power Purchases (Assumed all combustion turbines)[a]	0.0	5.3	3,542	0.0	2.0	+	5,486	0.2

[a] BPA 1993; [b] EPA 2000; [c] EPA 1996 + = Present in emissions from incomplete combustion -- = No data

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